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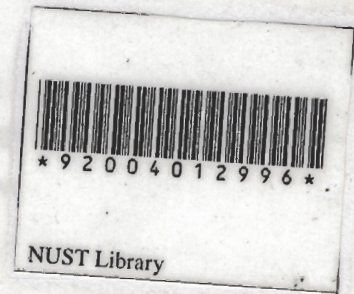
RESEARCH TITLE

APPLICABILITY OF PORTFOLIO OPTIMIZATION WITH CONDITIONAL VALUE AT RISK OBJECTIVE AND CONSTRAINTS TO EMERGING MARKETS.

Submitted in partial fulfillment of the requirements of the Bachelor of Commerce Honors Degree in Actuarial Science at the National University of Science & Technology (NUST).

ABSTRACT

This thesis implemented the Portfolio Optimization with Conditional Value at Risk (CVaR) constraints within an emerging market framework. This paper addressed the robustness of the stochastic optimization model with CVaR constraints as compared to the simple Mean-Variance model. A stochastic model was formulated in a similar way to Uryasev et al (2000). A case study for the portfolio consisting of top three Zimbabwe Stock Exchange (ZSE) listed stocks was used to demonstrate the robustness of the stochastic portfolio optimization model. In generating price scenarios, the researcher took into account the fact that emerging markets had discontinuities in the stock price process. This was done by modeling stock prices as following a Jump-Diffusion process. The stock prices generated over a two week period were then used as inputs in the stochastic optimization model and then implemented in LINGO, an optimization software. LINGO gave the optimal allocation strategy and the maximum return and the efficient frontiers showing the relationship between return and CVaR. The Mean-Variance model was also implemented in LINGO and results were compared with stochastic portfolio optimization with CVaR constraints.

Back testing results showed that the optimal return obtained from the stochastic optimization model approximated the historical return emphasizing that the model fitted the emerging market framework. In addition, comparison tests conducted showed that the portfolio optimization with CVaR was more robust as compared to the Mean-Variance model. The Jump-Diffusion fitted well under the emerging market framework. This thesis was successful in achieving its objectives stated in Chapter one.